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K/EM-350

SANITIZED VERSION OF MINUTES OF MEETING ON IMPURITIES FROM CASCADE FEED REPORT DATED 2/17/61

(SANITIZED VERSION OF CRD DOCUMENT # KL-1014)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

December 21, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY
under Contract DE-AC05-84OR21400

[redacted]

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Initial C-5-2

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To (Name) Mr. S. H. Smiley
Company
Location Building K-1401

Date February 17, 1961
Originating Dept. Engineering Development
Answering letter date

Subject Minutes of Meeting on Scavenging Impurities from Cascade Feed
KL-1014

Copy to

Chemical Division
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KL 1014 11 A

KL 1014 11 A

A meeting was held on January 20, 1961, to discuss the removal of impurities, such as technetium and vanadium, from Oak Ridge Gaseous Diffusion Plant feed streams. Those attending were A. L. Allen, H. A. Bernhardt, J. A. Parsons, J. E. Radway, S. H. Smiley, and S. S. Stief.

Mr. Smiley introduced the discussion with a brief history of the impurities problem and the related experimental program at the Paducah and Oak Ridge Gaseous Diffusion Plants. He indicated that the objectives of the studies are threefold: removal from uranium hexafluoride cascade feeds of impurities recovery of technetium and other exotic materials; and reduction of health hazards. Sorbents, such as nickel fluoride, calcium fluoride, aluminum fluoride, and magnesium fluoride, have been used to treat both liquid and gaseous uranium hexafluoride. Technetium is scavenged from either liquid or gaseous uranium hexafluoride by both calcium fluoride and magnesium fluoride, although the latter is apparently more effective.

Mr. Radway stated that Paducah was planning to install a magnesium fluoride sorption column in the C-410 feed plant between the fluorine towers and the cold traps. Tests in the Paducah feed plant employing gaseous uranium hexafluoride have substantiated laboratory results indicating high trapping efficiency, 98%, and high technetium concentrations, 0.8%, on the magnesium

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pellets. Studies on regeneration and reuse of the sorbent are in the preliminary stages, but it would appear that the technetium can be recovered by leaching techniques and that the magnesium fluoride could probably be reused either in the original pellet or by blending with fresh powder for repelletizing. The Dravo pelletizer, installed at Paducah, was used to make the original pellets. They had a high surface area, 70 sq.m./g., high mechanical strength, and were relatively stable to uranium hexafluoride.

Mr. Radway briefly summarized the results to date of a study of impurities in the ORGDP feed streams. He indicated that, during the period between April 7, 1960, and October 7, 1960, an average of 3.8 kg. of technetium was fed each month and that this quantity was derived mainly from the Paducah product, 30%, and the depleted reactor tails, 64%. The balance was attributed to the enriched reactor return stream. Mr. Parsons indicated that, while the technetium level in the Paducah product would probably decrease when Paducah's sorber goes on-stream, the technetium in the depleted reactor tails stream would be sufficient to justify a sorber installation at the Oak Ridge Gaseous Diffusion Plant.

Of course, other sorbents, specific for particular impurities, might have to be developed. Design considerations for a sorber installation and an estimated on-stream life for various size traps were presented.

1. Superficial gas velocity should be on the order of 1,000 feet per hour.

2. Pressure drop for the minus 1/4, plus 1/8 magnesium fluoride pellets made on the Dravo machine is on the order of 0.1 psi. per foot of bed for a uranium hexafluoride velocity of 1,000 feet per hour.

3. Experimental work was conducted with temperatures and pressures on the order of 200°F. and 12 psia.

4. A bed height in excess of 2.5 feet is not required to achieve high trapping efficiency but would be desirable from on-stream life considerations.

5. Technetium breakthrough would be expected after passage of approximately 1,000 pounds of uranium hexafluoride per pound of sorbent, assuming a technetium concentration on the order of 12 ppm, uranium basis.*

The estimated on-stream life of magnesium fluoride used as a sorbent material, assuming several different column diameters, is given in table I.

*During the period 8/8/60 to 12/8/60 the average technetium concentration in feed plant uranium hexafluoride fed to the Oak Ridge Gaseous Diffusion Plant was 8 ppm ranging from 0.2 to 19.4 ppm.

TABLE I

ESTIMATED ON-STREAM LIFE OF SORBER

Assumes feed rate of 1,800 pounds of uranium hexafluoride per hour; temperature, 225°F.; pressure, 25 psia.; inlet technetium concentration of 12 ppm; passage of 1000 pounds uranium hexafluoride per pound of sorbent

Column Diameter, Inch	18.0	24.0	30.0	36.0
MgF_2 Charge, lb./ft. of column	72.0	132.0	207.0	308.0
On-Stream Life, days/ft. of column	1.66	3.0	4.8	7.1
On-Stream Life, 4 ft. column, days	6.7	12.0	19.2	28.4

It was agreed that the group would meet again after Process Engineering personnel had an opportunity to look at the rough design criteria which were presented at this meeting.

J. E. Radway

J. E. Radway

/jb

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